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Technologies for creating and screening biological libraries at ultra high speeds.

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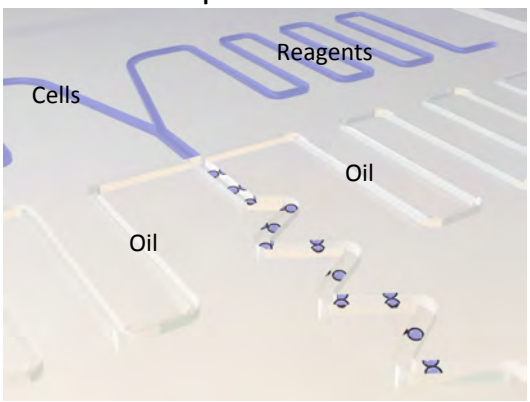
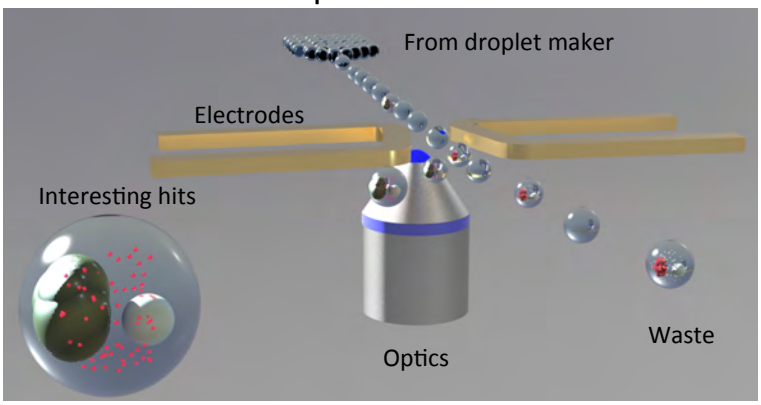
Healthcare is central for a sustainable community. However, healthcare costs are increasing and recently medicine costs have become an increasingly large expense. The reason is that developing new medicine is risky and costly. Here we describe technologies to address high costs (and slow) traditional high throughput screening. In particular we focus on creating and screening biological libraries, which is central for Denmark being one of the world leaders of biotech for medicine and protein engineering. The technology described is based on microfluidics droplets. These miniaturized reaction vessels (about 50pL and upwards) are generated at 1000 fold higher speed than pipetting robots operates microtiter plates (current high throughput screening system). Application areas that we currently are working with is isolation of therapeutic antibodies (together with Symphogen A/S), single cells transcriptomics (together with Vet), isolation of high protein producing cells for isolation of production cell lines (together with Symphogen A/S and DTU Food respectively) and isolation of bacteria mutants controlling the pH of yoghurt. Assays not possible in FACS machines are possible using the droplet technology.

Droplet maker



Droplet sorter



Droplet technology is based on a droplet maker that makes water droplets in oils at a speed of 2-20kHz (up to 20000 droplets per second). In this chips, cells and detection regents is mixed and encapsulated. After a brief incubation off chip, droplets are reintroduced into a sorting chip placed in a fluorescent microscope. If the cell has a desired function, a fluorescent signal can be detected from the droplet and then sorted by pushing the droplet into another channel than the waste. The sorting is done at about 1000 drops per second.